English Translation of JP-B-56-48129

(54) REMOVAL METHOD FOR PROJECTION OF KRILL

(57) Claims

1. A method for removing a projection of a krill, characterized by applying an external force to the krill during drying the krill.

2. The method for removing a projection of a krill according to Claim 1, wherein the drying of the krill is stopped before a water content of the krill becomes less than 25%.

3. The method for removing a projection of a krill according to Claim 1, wherein a water content of the krill immediately after the drying is from 25 to 65%.

4. The method for removing a projection of a krill according to Claim 1, wherein the external force is applied to the krill by a cyclic motion, such as a rotation, reciprocation or the like, of a container containing the krill.

5. The method for removing a projection of a krill according to Claim 1, wherein the external force is applied to the krill by a cyclic motion, such as a rotation, reciprocation or the like, of a stirring paddle, a stirring rod or the like.

6. The method for removing a projection of a krill according to Claim 1, wherein the external force is applied to the krill by a strong air stream having a speed higher than a linear speed

at which the krill is fluidized.

Detailed Description of the Invention

The present invention relates to a method for removing a projection of a krill.

The krill (genus euphausia or the like) is a most abundant unutilized aquatic resource and, since it has a shrimp-like taste, catches thereof are, recently, gradually increasing.

Studies on development of applications of krill have so far been exerted and, then, a shelled raw krill, a dried krill, a krill freed of projections and the like are already on the market as commercial processed products.

Among these products, a product freed of the projections is called as "Dharma" in a krill industry and indicates a processed product in which an eyeball, a whisker, a thoracic leg, an abdominal leg and a pygidium are separated and removed from the krill while maintaining an intrinsic body shape. The product freed of the projections can be produced by using such processing measure as a vibration method, a shot blast method or an air blast method, and commercial products now available on the market are produced by the vibration method. In any one of these methods, krill are boiled, individually frozen, applied with impact such as vibration while in a frozen state and, then, freed of the projections. By any one of these methods, a favorable product having a yield of about 70% can

be obtained.

However, as described above, since any one of these processing methods contains a step of individually freezing the krill and it is necessary to keep the krill at a temperature of less than -20°C at the time of applying the impact, large-scale refrigeration facilities are required; therefore, from the economical standpoint, these methods each inherently have a large problem.

Then, the present inventors have exerted studies on development of a method for removing projections of a krill without freezing the krill. During the studies, the inventors have found that, when the krill is dried, such drying is progressed from a surface portion by priority and the projections become brittle. The present invention has been achieved based on such finding as described above.

An object of the invention is to provide a method for removing a projection of a krill which is characterized by applying an external force to the krill during drying the krill.

The term "krill" herein used means a krill in a raw state, that in a boiled state, that in a processed state in which internal organs or the like are removed, or mixtures thereof. Further, drying measures are not particularly limited; however, ordinarily, through-flow drying is preferred. It is necessary to stop drying the krill before a water content thereof becomes less than 25% and, ordinarily, drying is performed such that

a water content of the krill immediately after the drying is from 25 to 65%. When a water content of the krill becomes less than 25% by drying, the thus-dried krill product is not only freed of the projections but also shelled, which causes the krill to look unattractive and reduce a commercial value. Further, the yield comes to be deteriorated and, then, such drying can not be said as an appropriate processing measure. On the other hand, when a water content thereof is over 65%, the krill product is insufficient in removal of the projections which is aimed for.

Next, the external force to be applied during drying the krill is not particularly limited and there are, for example, a method which subjects a container containing the krill to a cyclic motion, such as a rotation, reciprocation or the like, a method which subjects a stirring paddle, a stirring rod or the like to a cyclic motion, such as a rotation, reciprocation or the like, in a container containing the krill, or a method which adds a strong air stream having a speed higher than a linear speed at which the krill is fluidized. Further, the stirring paddle, the stirring rod or the like may be used either separately from the container or as a unity combined with the container. The term "a strong air stream having a speed higher than a linear speed at which the krill is fluidized" herein used means, although depending on factors such as a size and shape of the container and an amount of the krill to be filled,

ordinarily, aeration with an air flow of from about 0.5 to about 5 m/sec.

According to the invention, it is important to remove the projections of the krill not after drying but during drying. According to experiments of the present inventors, moisture is not only evaporated from the surface portion of the krill but also diffused from inside the krill during drying. Further, since the surface portion of the krill is in a dry brittle state during drying, when the external force is applied such that the krill is physically vibrated, the projections of the krill can easily be separated and removed. However, when drying is stopped, the projections rapidly become softer with water diffused from inside the krill and become resilient and, then, it becomes impossible to efficiently remove the projections.

When the external force is applied to the krill during drying, the krill themselves collide with each other, with an inner wall of the container and/or with the stirring paddle or the like and, then, projections thereof, such as eyeballs, whiskers, thoracic legs, abdominal legs and pygidia are separated and removed from the krill. The thus-separated and removed projections can be separated from a body meat portion by filtration or the like. When the through-flow drying is performed, the projections are taken away to the outside of the container by being carried by the air stream and are, accordingly, separated from the body meat.

The method according to the invention is economical compared with a conventional vibration method and, further, since it can separate and remove the projections during drying, processing steps are extremely simple. Still further, since the krill product freed of the projections is not overly dried, reconstitution with water can easily be performed. Even still further, it can be mentioned as one of the characteristics of the invention that, when the surface portion of the krill is dried, red tint of color becomes deeper and, then, appearance thereof becomes more attractive than before and a commercial value thereof is accordingly enhanced.

Next, the invention is described in more detail with reference to embodiments.

Example 1

A water content of krill (average length: 4.5 cm) which were boiled and subjected to centrifugal dehydration was 78.0%. 1 kg of such krill as described above was packed in a container 40 cm long and 40 cm wide fit with a metal mesh at a bottom, dried by a hot air at 80°C while deftly mixing with a wood-made spatula 7 cm wide. After such operations as described above were continued for 10 minutes, the resultant krill were subjected to separation with a 5-mesh sieve, to thereby obtain 236 g of the krill (water content: 42.3%) freed of projections. Therefore, yield of the resultant krill product was 61.8%. Namely, a portion corresponding to 38.2% of a dried article

was separated and removed.

Example 2

A water content of krill (average length: 4.5 cm) in which internal organs were previously removed and which were boiled and subjected to centrifugal dehydration was 79.2%. 1 kg of such krill as described above was packed in a same container as in Example 1 and, then, a metal mesh was provided all over the container as a cover. Next, when the krill were aerated with a warm air at 45°C having an air flow of 15 m^2/min, the krill started to be fluidized after 8 minutes have passed. After such operations as described above were continued for 30 minutes, the resultant krill were subjected to separation with a 5-mesh sieve. As a result, 197 g of krill product freed of projections and having an attractive appearance was obtained. Since a water content of the product was 37.6%, yield thereof was 59.1%.

Example 3

100 g of raw krill (water content 80.6%) was put in a 30-mesh reference sieve and, then, the tope of the sieve was covered with a same reference sieve. Next, the krill were subjected to the through-flow drying with a hot air at 60°C. On this occasion, operations of aerating the hot air for 40 seconds and, then, applying the external force to the krill by shaking the sieve with a hand for 20 seconds were defined as one cycle and the thus-defined cycle was repeated for

predetermined times. Thereafter, the krill were subjected to separation with a 5-mesh sieve and, then, the results were obtained and are shown in Table 1.

Table 1

Drying time (min)	Product weight (g)	Water content of product (%)	Yield (%)
5	53.3	68.2	87.4
10	27.2	47.7	73.3
20	20.6	38.2	65.6
30	17.4	30.5	62.3
40	15.8	26.6	59.8
60	11.3	16.9	48.4

When each product was inspected, the product subjected to 5-minute drying was insufficient in removal of the projections. On the other hand, the product subjected to 60-minute drying was not only freed of the projections but also substantially shelled and the product was inferior in appearance to a great extent. Further, yield of the product was unfavorable and, from the economical standpoint, such drying as described above can not be said as an appropriate method.

⑲日本国特許庁(JP)　⑪特許出願公告

⑫特許公報(B2)　昭56－48129

⑤1 Int.Cl.³　識別記号　庁内整理番号　⑳㊹公告　昭和56年(1981)11月13日

A 22 C 29/02　7258－4B

発明の数 1

(全3頁)

1

㊹オキアミ突起物の除去法

㉑特　願　昭54－111708
㉒出　願　昭54(1979)9月3日
公　開　昭56－35945
㊸昭56(1981)4月8日

㉒発明者　小林登史夫
東京都豊島区長崎1丁目14番14号
㉒発明者　柳本正勝
茨城県新治郡桜村花室1506番寮2丁目801－201
㉑出願人　農林水産省食品総合研究所長
㉔代理人　弁理士　久保田藤郎

㊼特許請求の範囲

1　オキアミの乾燥中に該オキアミに外力を加えることを特徴とするオキアミ突起物の除去法。

2　オキアミの乾燥を該オキアミの水分含量が25%未満となる前に中止する特許請求の範囲第1項記載のオキアミ突起物の除去法。

3　乾燥直後のオキアミの水分含量が25～65%である特許請求の範囲第1項記載のオキアミ突起物の除去法。

4　オキアミを入れた容器の回転、往復等の周期的運動によりオキアミに外力を加える特許請求の範囲第1項記載のオキアミ突起物の除去法。

5　撹拌翼、撹拌棒等の回転、往復等の周期的運動によりオキアミに外力を加える特許請求の範囲第1項記載のオキアミ突起物の除去法。

6　オキアミが流動化する線速度以上の強い気流によりオキアミに外力を加える特許請求の範囲第1項記載のオキアミ突起物の除去物。

発明の詳細な説明

本発明はオキアミ突起物の除去法に関する。

オキアミ(Euphausia属など)は最も豊富な未利用水産資源であり、しかもエビ様風味を持つことから近年、次第にその漁獲量が増してきている。

2

これまでにオキアミの用途を開発するための努力がなされており、すでに加工品として生むき身製品、乾燥品、突起物の除去された製品などが商品として市場に現れている。

これら商品のうち突起物除去製品のことを業界では「ダルマ」と称しているが、これはオキアミの眼球、ヒゲ、胸脚、腹脚、尾節が分離、除去され、かつ姿身の体形が保持されている加工品である。この突起物除去製品は、振動法、ショットブラスト法、エアーブラスト法等の処理手段によつて製造することができ、現在商品化されているものは振動法によるものである。いずれの方法もオキアミをボイルした後、個別凍結し、凍結したままでオキアミに振動などの衝撃を与えて突起物を除去するのである。これらの方法により歩留りが70%程度の良好な製品が得られる。

しかしながら、上述したように、これらの処理方法にはオキアミを個別凍結する工程が含まれており、しかも衝撃を与える際にもオキアミを－20℃以下に保つ必要があることから、巨大な冷凍設備を要し、経済的立場からこれらの方法は大きな問題点をかゝえている。

そこで本発明者らは、オキアミを凍結することなく突起物の除去を行なう方法を開発すべく鋭意研究を重ねた。その過程において、オキアミは乾燥中において、まず表層部より乾燥が優先的に進行し、突起物が脆くなることを見出した。本発明はかゝる知見に基いて完成したものである。

本発明はオキアミの乾燥中に該オキアミに外力を加えることを特徴とするオキアミ突起物の除去法を提供するものである。

本発明に用いるオキアミは生の状態のもの、ボイルされたもの、脱内臓等の前処理を受けたものあるいはこれらの混合物などを意味する。また、乾燥手段についても特に制限はないが、通常は通風乾燥が好ましい。オキアミの乾燥は水分含量が

3

２５％未満となる前に中止することが必要であり、一般的には乾燥直後のオキアミの水分含量が２５～６５％となるようにすべきである。乾燥によつてオキアミの水分含量が２５％未満となると、乾燥したオキアミ製品は突起物の除去と共に脱殻し、見栄えが劣り商品価値が低下する。しかも、歩留りも悪く適切な処理法とは言えない。一方、水分含量が６５％を越えるオキアミ製品は目的とする突起物の除去が十分でない。

次に、オキアミの乾燥中に加える外力については特に制限はなく、たとえばオキアミを入れた容器を回転、往復等の周期的運動をさせる方法、攪拌翼、攪拌棒等をオキアミを入れた容器内で回転、往復等の周期的運動をさせる方法、オキアミが流動化する線速度以上の強い気流を加える方法などがある。なお、攪拌翼、攪拌棒等は容器と独立させて用いてもよく、あるいは容器に一体的に取付けて使用してもよい。オキアミが流動化する線速度以上の強い気流とは、容器の大きさ、形状等やオキアミの充てん量等の因子により異なるが、一般的には0.5～5 m／sec程度の風量で通気することを意味する。

本発明において、乾燥後でなく乾燥中にオキアミの突起物を除去することが重要である。本発明者らの実験によると、乾燥中オキアミの表層部より水分が蒸発すると共に内部より水が拡散している。しかも、乾燥中にあつてはオキアミの表層部は乾いて脆弱な状態となつているため、外力を加えてオキアミを物理的に振動せしめると突起物は容易に分離、除去することができる。しかし、乾燥を中止すると、内部より拡散してきた水によつて突起物は急速に柔軟さを増し、粘りが出てくるので、突起物の除去を効率よく行なうことが不可能になる。

乾燥中にオキアミに対して外力を加えると、オキアミ同士の衝突や容器内壁および／または攪拌翼等との衝突により眼球、ヒゲ、胸脚、腹脚、尾節などの突起物が分離し除去される。分離、除去された突起物は篩分け等によつてオキアミ身肉部と分別することができるが、通気乾燥による場合は突起物が気流に乗つて容器外へ飛び出てオキアミ身肉部と分別することもできる。

本発明の方法は従来の振動法などとに比べて安

4

価な方法であり、しかも乾燥中に突起物を分離、除去するので工程上もきわめて簡便である。また、突起物の除去されたオキアミ製品は乾燥が過度に進行していないため、水戻しも容易である。さらに、オキアミの表層部が乾燥すると、赤味が増して乾燥前よりも外観上美麗であり商品価値が向上することも本発明の特色の１つとしてあげることができる。

次に、本発明を実施例により詳しく説明する。

実施例　1

オキアミ（平均体長 4.5 cm）をボイルしたのち遠心脱水したものは水分含量が７８.０％であつた。このオキアミ１kgを４０cm角の枠で底部が金網張りとしたものに充てんし、８０℃の熱風で通気乾燥しながら幅７cmの木ヘラで手際よくかき混ぜた。この操作を１０分間続けた後、５メツシユの篩で分別することにより突起物が除去されたオキアミ（水分含量４２.３％）が２３６g得られた。したがつて、この製品の歩留りは６１.８％である。つまり３８.２％の乾物量に相当する部分が分離、除去されたことになる。

実施例　2

予め脱内臓処理を施したオキアミ（平均体長 4.5 cm)をボイルしたのち遠心脱水したものは水分含量７９.２％であつた。このオキアミ１kgを実施例１と同じ容器に充てんし、該容器の上から金網の蓋をした。次いで４５℃の温風を１５ m³／min. の風量で通気したところオキアミは８分後から流動化したが、この操作を３０分間続けた後、５メツシユの篩で分別した。その結果、突起物の除去された、かつ外観の美しいオキアミ製品が１９７g得られた。この製品の水分は３７.６％であつたので、歩留りは５９.１％である。

実施例　3

生オキアミ（水分含量８０.６％）１００gを３０メツシユの標準篩に入れ、同じ標準篩を用い上方から蓋をした。次いで、６０℃の熱風で通気乾燥をしたが、この場合、はじめに４０秒通気したのち２０秒間篩を手で振つてオキアミに外力を与える操作を１サイクルとして所定回数繰返した。しかる後、５メツシユの篩で分別したところ下表のような結果が得られた。

5

第　1　表

乾燥時間(分)	製品重量(g)	製品水分含量(%)	歩留り(%)
5	53.3	68.2	87.4
10	27.2	47.7	73.3
20	20.6	38.2	65.6
30	17.4	30.5	62.3
40	15.8	26.6	59.8
60	11.3	16.9	48.4

6

それぞれの製品について観察すると、５分間乾燥したものは突起物の除去が不十分であつた。一方、６０分間乾燥した製品は突起物の除去と共にかなり脱殻しており、見栄えも非常に劣つていた。また、この製品は歩留りも悪く、経済的立場からも適切な処理法とは言えない。